Journal of Data Mining and Management
e-ISSN: 2456-9437
Volume 03, Issue 02
4th National Conference on Advancements in Information Technology

Sensors Based Trash Can Using IOT

Manisha R Rao, Anagha Phaniraj, Gayatri K, Jothis Susan Thomas
Department of CSE
Jyothy Institute of Technology, Tataguni, Bangalore
Email: mannu.r.rao@gmail.com, aniphani4@gmail.com, gayatrikyadav.14@gmail.com, jothis.susanthomas@gmail.com

Abstract

The main theme of our project is to develop a sensor based dustbin for a proper garbage management. This project depicts a worthy elucidation for maintaining green environment. The disposal of waste can be done efficiently by segregating between dry waste and wet waste. This system reduces the maintenance stress. A smart handling technology is used to avoid all such hazardous scenario and maintain cleanliness. The whole process is upheld by an embedded system integrated with microcontroller and sensors. The dustbin lid will automatically open when something is sensed within its boundary or limit. This project works on the basis of colour sensor. The sensor distinguishes the colour for efficient disposal of garbage. Thus the system is solution for environmental maintenance and reduces the work of human intervention in garbage maintenance.

Keywords: *Arduino Uno, Tcs3200, Ultrasonic Sensor Hc*

INTRODUCTION

Rapid growth in urban population along with economic growth and rise in community living standards have resulted in generation of huge quantities of waste disposal. The waste disposal has become a major problem to municipalities and corporations in terms of collection and disposal of waste. Considering our current methods of waste management in the cities, the authorities are unequipped with the technologies needed for such a large scale waste management system. Approximately 5000 tons of waste is generated in a fast expanding city like Bengaluru out of which only 30% waste is collected by BBMP directly and the 70% of municipal waste is collected and transported through contractors. Due to financial constraints a proper municipal waste collection and disposal mechanism is not in place.

The smart bin waste management system contains a number of sensors like ultrasonic sensor, a servo and an Arduino board.

To improve solid waste management in city the pollution board has suggested three colours for dustbins - green for biodegradable waste, blue for non-degradable waste, red for medical waste. As per Solid Waste Management Rules 2016,"every waste generator needs to segregate and store the waste generated by them in three separate streams namely biodegradable, non-degradable and medical wastes in suitable bins and handover the segregated wastes to authorized garbage collectors.

The BBMP started a program for learning and communicating to extend the knowledge about waste isolation, from the starting place and to pass on message to the people about the innovative ideas technology about the garbage gathering. This project depicts a worthy elucidation for maintaining green environment.

Smart dustbin design

Necessity: An efficient waste management System, not only contaminates the surrounding but it also has an adverse effect to health of mankind. The very basic ill mentalities of cleaning own house and trashing the garbage outside lays the foundation of the problem of waste disposal management. In layman terms, everyone understands it as disposing of garbage and keeping the environment clean is important. But the definition of environment in our mind restricts our house only. Everyone tend to clean the garbage of our home and then dispose it off to a roadside dumping area. Instead if we implement the process of segregating garbage according to biodegradable, non-biodegradable and medical waste and finally handing it to the garbage collector every morning. The garbage can be disposed separately considering colour code for each type of waste.

The use of this smart dustbin might bring a ease to the garbage collectors who has to dispose the particular type of garbage to particular bin in order to get an efficient waste management process and prevent widespread of diseases and stop the deterioration of environment.

Design: a general purpose peddled dustbin is infixed with two ultrasonic sensors, one colour sensor and a servo motor which on whole is controlled by a microcontroller. The microcontroller we consider is arduino UNO board. Once the ultrasonic sensor is infixed inside the dustbin lid, it will monitor the amount of waste in it. If the dustbin is filled upto a certain level then an alert can be sent to BBMP office so they can empty the bin, hence avoid overflow of garbage. The other ultrasonic sensor is placed on the bin such that it sense object placed at front and opens the lid with the help of servo motor when the conditions are satisfied considering the colour code for waste disposal.

ARDUINO UNO

The Arduino Uno is a microcontroller board grounded on the ATmega328 (datasheet). It comprises of 14 digital input/output pins (out of which 6 can be utilized as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a facilitation for USB connectivity, a power jack, an ICSP header, and a reset button. Its designs comprises of assistances that supports the microcontroller in every possible way. In order to get to work with it one has to simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery.

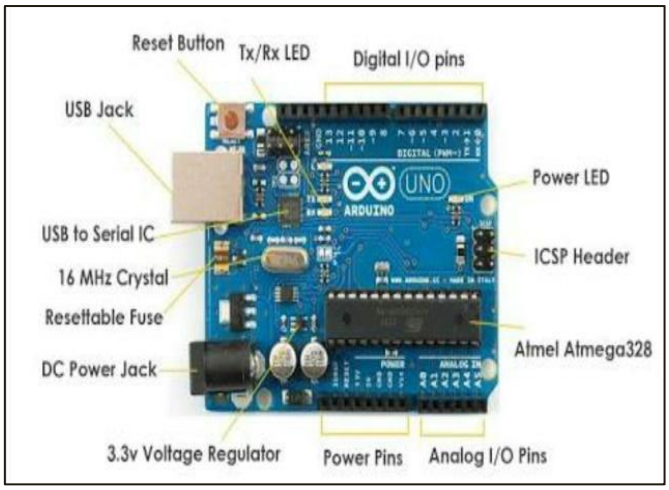

Fig 1. *Arduino Uno*

Arduino Uno and Genuino Uno are the two versions of this board.

The Italian word UNO refers as one. It's also a reference for the version type in Arduino boards.

ULTRASONIC SENSOR HC - SR04

Ultrasonic ranging module HC - SR04 offers a 2cm - 400cm non-contact measurement function, the ranging accuracy could reach up to 3mm. The building modules includes ultrasonic transmitters, receiver and control circuit.

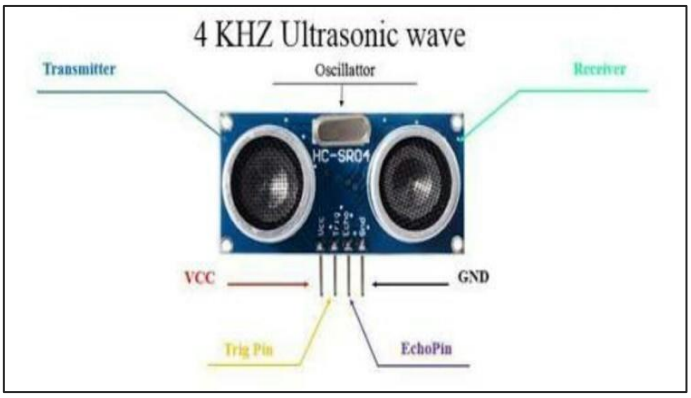

Fig 2. *Ultrasonic sensor HC - SR04*

The basic principle

1. Making use of IO trigger for at least 10us high level signal,
2. The Unit inevitably sends eight 40 kHz and detects whether there is any pulse signal back.
3. If any of a signal is received back in a high level, time of high output IO duration is the time from sending ultrasonic signal and receiving it back

Test distance = (high level time× velocity of sound (340M/S) / 2

Working of ultrasonic sensor

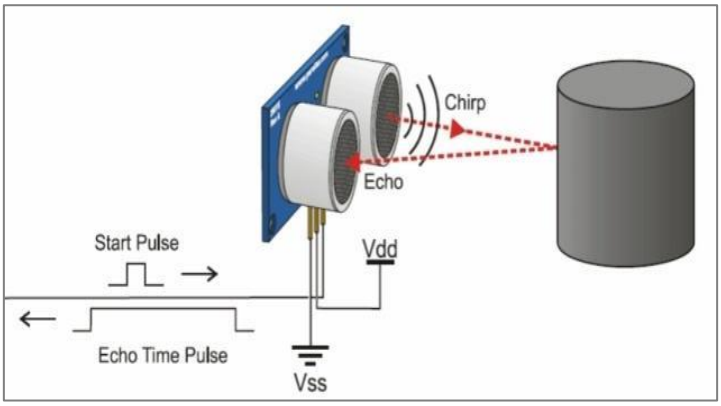

Fig 3. *Working of ultrasonic sensor*

Here to send the pulse, the electrical energy is transformed into sound. The sound is received at the receiver end and then its converted into electricity. Thus to estimate the distance to the object, the time taken between the sender and receiver is used. If two sensors are being used they should be kept in an angle such that they do not interfere with each other. This interference is sometimes referred to as “crosstalk”. The target should be placed perpendicular to the axis of the sensor.

TCS3200 colour sensor

TCS3200 contains RGB (Red Green Blue) arrays. The microscopic level is the square boxes inside the eye on sensors. These are of RGB matrix. Each of these boxes contain three sensors, one is for sensing RED light intensity, one is for sensing GREEN light intensity and last is for blue light intensity. These are selected separately as requirement.

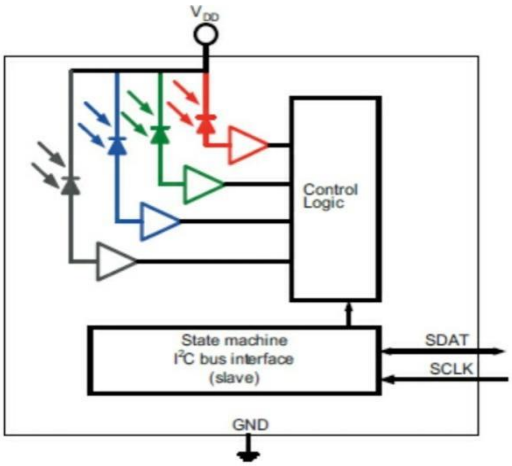

Fig 4. *Circuit diagram of TCS3200*

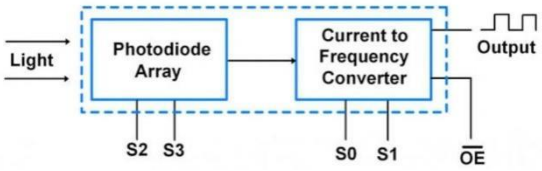

Fig 5. *Working flow diagram of TCS3200*

IMPLEMENTATION

The system is implemented in such a way that, to disposal of garbage is carried out in a smarter way which can be implemented in the society for a clean and bright future. The whole process is upheld by an embedded system integrated with microcontroller and sensors. When an object (i.e. garbage to be disposed) is taken near the dustbin, the ultrasonic sensor attached to dustbin sense it and conveys the same to the servo motor. The servo motor at a certain angle, hits the peddle of the dustbin and the garbage can be disposed neatly. The disposal of waste can be done efficiently by segregating between non-biodegradable waste and biodegradable waste. This system reduces the maintenance stress.

Garbage collected and segregated from the house may have some amount of mixed quantity. This issue can be solved by disposal of waste through colour coded bags. There can be 3 separate dustbins implemented with 3 different Arduino UNO board and the required components. Each dustbin is assigned a different colour bag, and coded to perform according to the colour bags.

The three colour bags namely blue, green and red. Each of them has a specific task. The functions or tasks of each colour bag are as follows:

Blue– for disposal of non-biodegradable waste, green – for disposal of biodegradable waste and red for – disposal of medical waste. This can be done using a

colour sensor TCS3200 which can detect any number of colours.it contains RGB arrays.

We can use a display to display the type of garbage that is being disposed. For more efficient usage, one can program it in such a way that it sends an alert to the BBMP office once the garbage reaches a certain distance. This helps in maintaining the surrounding clean and also prevent the atmosphere from being affected by pollution.

CONCLUSION

A smart city can only be called "SMART" when it can provide better service for all the energy requirements and maintain cleanliness. In the entire world, waste management is major challenging work. If it is not properly disposed or cleaned it will lead to lot of diseases and spoil the green environment. This project will basically work to maintain a clean and green environment by an implementation of smart IOT based garbage management system using an ultrasonic sensor, colour sensor, servo motor etc. It is also an embedded based intelligent alert system that is devised for the proper monitoring and maintenance of the garbage. As our project basically works on colour based it is easy even for any person to dispose the garbage in a proper manner such that it remains un-mixed. The recycling process can be used to convert the biodegradable (wet waste) to make fertilizer at planting and in making of biogas.

Therefore this arrangement or setup comes in handy as a worthy solution in maintaining the environment issues. It also helps in decreasing the human involvement in maintenance of garbage and thereby by reduces the environmental pollution.

REFERENCES

1. Gogoi.L (2012). “Solid Waste Disposal and its Health Implications in Guwahati City: A Study in Medical Geography", Lambert Academic Publishing, Germany
2. Anderi Borozdukhin, Olga Dolinina and VitalyPechenkin, “Approach to the Garbage Collection in the Smart Clean City Project” in ,Yuri Gagarin State Technical University of Saratov, Russia 2016.
3. N. Sathish Kumar, B. Vuayalakshmi, R. Jenifer Prarthana, A. Shankar. "IOT based smart garbage alert system using Arduino UNO", 2016 IEEE Region 10 Conference (TENCON), 2016
4. Dilip Raja, colour detector using Arduino 2015.
5. Sourangsu Mukherjee, Budhaditya Bhattacharyya, Neelkantha Banerjee. "Harnessing green energy for smart dustbin" , 2017 IEEE International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM), 2017
6. Cyril Joe Baby, Harvir Singh, Archit Srivastava, Ritwik Dhawan, P. Mahalakshmi. "Smart bin: An intelligent waste alert and prediction system using machine learning approach", 2017 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), 2017
7. S. Vinoth Kumar, T. Senthil Kumaran, A. Krishna Kumar, Mahantesh Mathapati. "Smart garbage monitoring and clearance system using internet of things" , 2017 IEEE International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM), 2017